

# Highly Effective Thermal Regenerator for Low Temperature Cryocoolers, Phase I

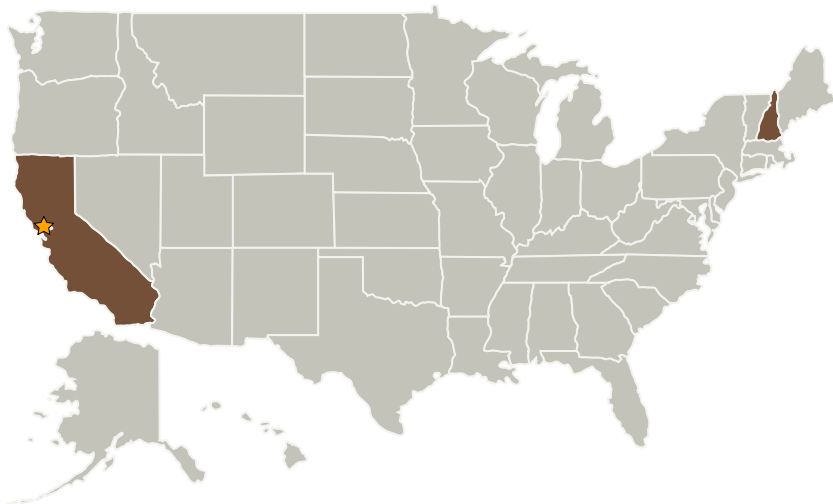
Completed Technology Project (2006 - 2006)



## Project Introduction

Future missions to investigate the structure and evolution of the universe require highly efficient, low-temperature cryocoolers for low-noise detector systems. We propose to develop a highly efficient low-cost regenerator for regenerative cryocoolers with cooling temperatures in the range of 15 K and below. The proposed regenerator uses an innovative non-rare-earth material to achieve a volumetric specific heat of about 0.65 to 0.31 J/cm<sup>3</sup>-K at temperatures of 15 to 4.2 K. The large heat capacity will substantially reduce the thermal swing during periodic heat transfer and therefore improve the efficiency of low-temperature regenerative cryocoolers. The regenerator will be lightweight and easy to fabricate. In Phase I we will optimize the regenerator for a specific cooling application. We will use the resulting design and model to show that a regenerative cryocooler can achieve a very high efficiency. In Phase II we will build a prototype regenerator, measure its key performance parameters, and integrate it with an existing cryocooler to demonstrate its high thermal effectiveness.

## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Creare LLC	Supporting Organization	Industry	Hanover, New Hampshire



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Ames Research Center (ARC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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## Primary U.S. Work Locations

California

New Hampshire

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

## Technology Areas

### Primary:

- TX14 Thermal Management Systems
  - └ TX14.1 Cryogenic Systems
    - └ TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors